LINE OUTPUT PENTODE

Output pentode intended for colour TV line deflection circuits.

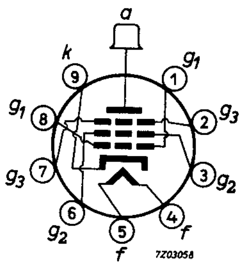
HEATING: Indirect by A.C. or D.C.; series supply

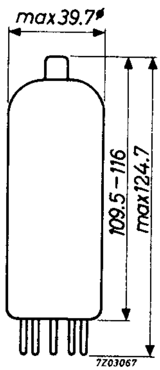
Heater current	I_f	300	mA
Heater voltage	V_f	40	V

DIMENSIONS AND CONNECTIONS

Base: Magnoval
Top cap: Type 1
Mounting: Additional supporting of the tube at the top is required.

Dimensions in mm





CAPACITANCES

Grid No. 1 to filament	C_{g1f}	max.	0.2	pF
Anode to grid No. 1	C_{ag1}	max.	3.0	pF
	C_{ag1}		2.5	pF

TYPICAL CHARACTERISTICS (measured under pulse conditions)

Anode voltage	V_a	160	50	70	V
Grid No. 3 voltage	V_{g3}	0	0	0	V
Grid No. 2 voltage	V_{g2}	160	175	205	V
Grid No. 1 voltage	V_{g1}	0	-10	-11	V
Anode current	I_a	1400	800	1100	mA
Grid No. 2 current	I_{g2}	45	70	85	mA

OPERATING CONDITIONS (D.C. feedback)

Cut-off voltage

The minimum required cut-off voltage ($-V_{g1}$) during flyback at V_a = 7000 V and at line frequency is at :

$$V_{g2} = 150\text{ V} : V_{g1} = -175\text{ V}$$
$$V_{g2} = 200\text{ V} : V_{g1} = -195\text{ V}$$
$$V_{g2} = 250\text{ V} : V_{g1} = -215\text{ V}$$

Minimum required anode voltage during the scanning period : V_a min. See page 6

Minimum required screen grid voltage: V_{g2} min. See page 4, 5

Recommended screen grid series resistor: R_{g2} rec See page 4, 5

Decoupling capacitors in the grid no.2 and/or grid no.3 circuit

In circuits where decoupling capacitors in the grid no.2 or the grid no.3 circuits are applied, incidental flashover in the tube may give rise to excessive discharge currents and component or tube failure.
Therefore it is recommended to limit the discharge currents from these capacitors by means of a 100 Ω resistor between g_2 and the g_2-bypass capacitor and a 1000 Ω resistor between g_3 and the g_3-bypass capacitor. The 1000 Ω resistor should be protected by a spark-gap connected between g_3 and earth.

Hum

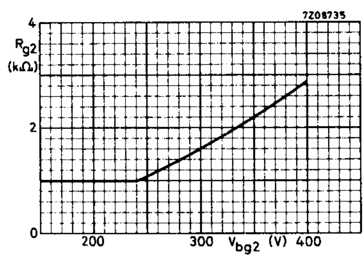
At Z_{g1} = 200 kΩ (f = 50 Hz), $V_{kf_{RMS}}$ = 220 V and without wiring and socket capacitance, the equivalent grid hum voltage is less than 5 mV.

LIMITING VALUES

	Design centre rating system				
Anode voltage in cold condition	V_{ao}	max.	700	V	
Anode peak voltage	V_{ap}	max.	7000	V	
Anode dissipation	W_a	max.	35	W	
Grid No. 3 voltage	V_{g3}	max.	30	V	
Grid No. 2 voltage in cold condition	V_{g2o}	max.	700	V	
Grid No. 2 voltage	V_{g2}	max.	275	V	
Grid No. 2 dissipation	W_{g2}	max.	7	W	[2]
Cathode current	I_k	max.	500	mA	
Cathode peak current	I_{kp}	max.	1500	mA	
Cathode-to-heater voltage	V_{kf}	max.	250	V	
Grid No. 1 resistor: fixed bias	R_{g1}	max.	0.5	MΩ	[3]
stabilized circuits	R_{g1}	max.	2.2	MΩ	[3]
Grid No. 3 circuit resistance	R_{g3}	max.	10	kΩ	[4]
Bulb temperature	t_{bulb}	max.	300	°C	[5]

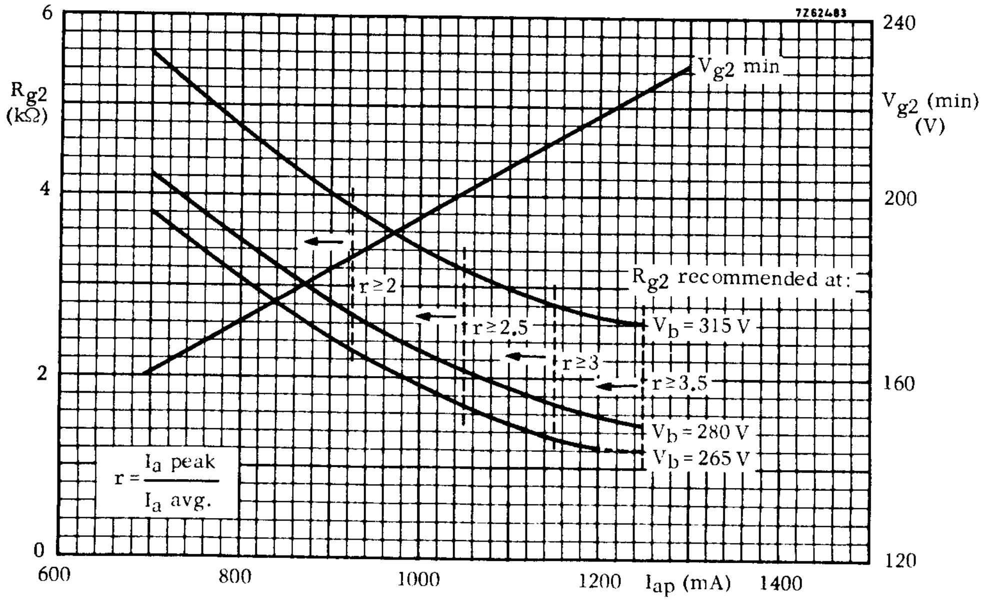
	Design max. rating system [6]				
Anode dissipation	W_a	max.	45	W	
Grid No. 2 dissipation	W_{g2}	max.	9	W	
Anode peak voltage	V_{ap}	max.	8000	V	[1]
Neg. grid No. 1 peak voltage	$-V_{g1p}$	max.	550	V	[1]

1. Max. pulse duration is 22% of a cycle and max. 18 μs.
2. To prevent an excessive value of W_{g2} the minimum R_{g2} values are given in the graph below.

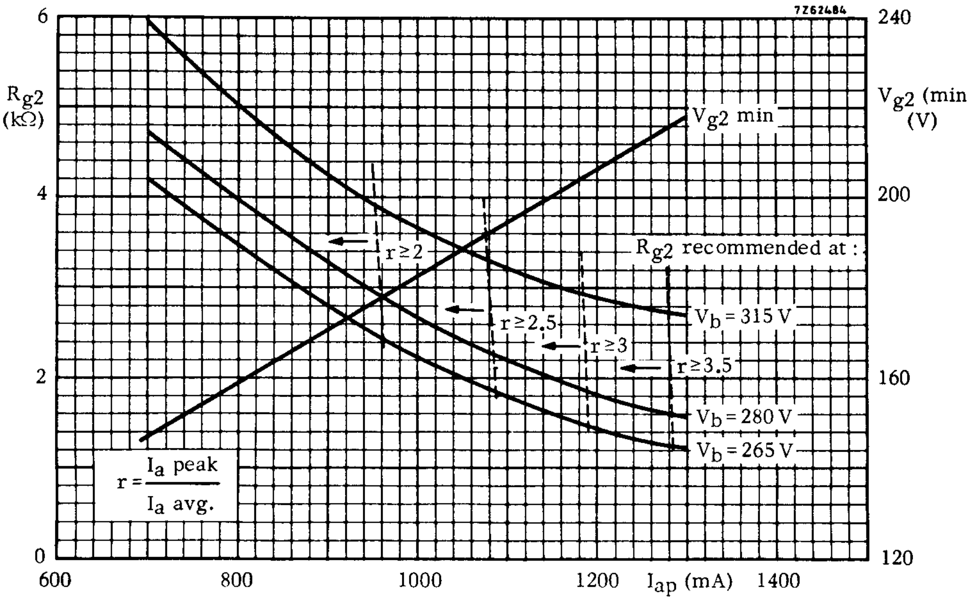


3. The circuit design has to be such that negative control grid currents up to 5 micro-amperes do not have any detrimental effect upon tube adjustment or circuit performance.
   Care should be taken that with 5 micro-amperes grid current the limiting values for I_k, W_a and W_{g2} are not exceeded.
4. With $R_{g3} \leq 10$ KΩ capacitive decoupling of g_3 is not required.
5. Absolute max. value.
6. The design maximum limits should not be exceeded with a nominal tube under the worst probable operating conditions at a normal picture width.

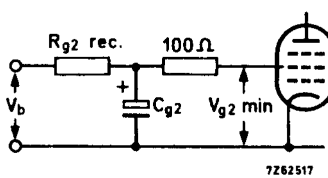
Min. required V_{g_2} and recommended R_{g_2}
Non-stabilized supply voltages.



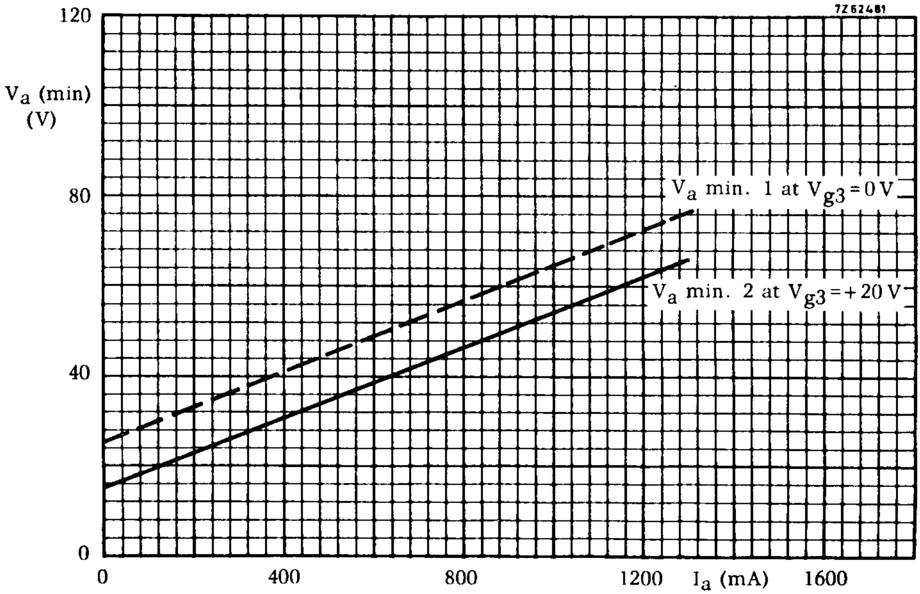
Min. required V_{g_2} and recommended R_{g_2}
Stabilized supply voltage.



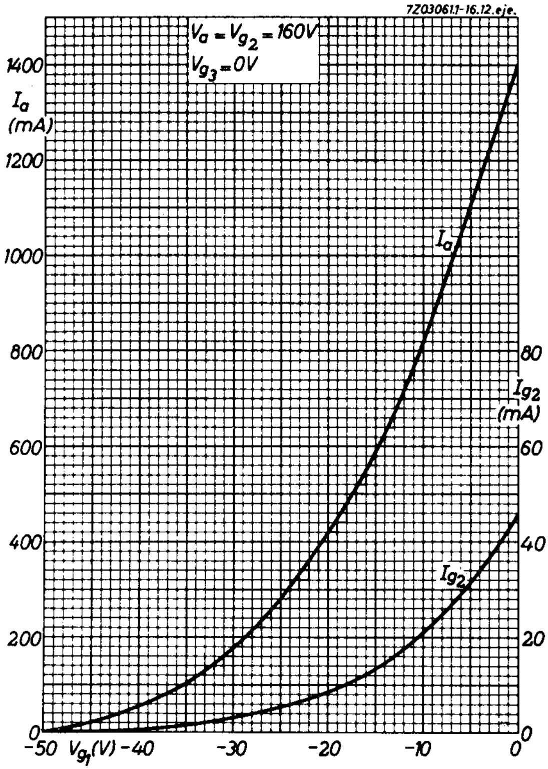
The above graphs concern the design of a line-output circuit adjusted at a beam current of 1000 μA and a nominal mains voltage.
If the recommended R_{g_2} is used, V_{g_2} will be equal to higher or than the specified V_{g_2} min. and there will be adequate reserve in anode peak current throughout the life of the tube. (Tolerances of deflection-components and 10 % mains voltage fluctuations taken into account).

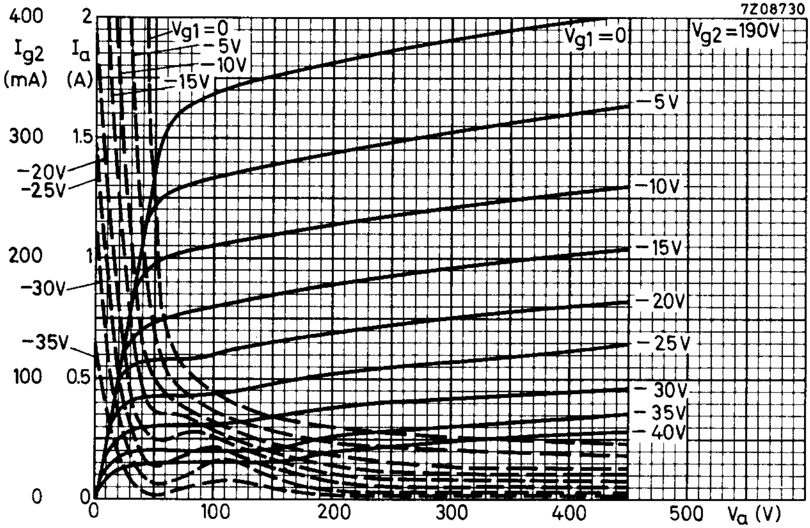


Min. required anode voltage, during the scanning period.



To suppress Barkhausen interference and to ensure stability, the anode load line should not be allowed to drop below the V_a line shown in the diagram. If V_a min. must be low, the V_a min. 1-line can be shifted over 10 V to $V_a$min. 2, provided a D.C. voltage of at least +20 V is applied to the beam plate (g_3). To compensate for the influence of mains voltage fluctuations, the specified values of V_a min. must be increased with 10 % of the anode supply voltage when not stabilized.


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$V_a = V_{g_2} = 160V$
$V_{g_3} = 0V$
I_a
(mA)
1400
1200
1000
800
600
400
200
0
I_{g2}
(mA)
80
60
40
20
0
I_a
I_{g_2}
-50
$V_{g_1}(V)$
-40
-30
-20
-10
0


7Z08730
400
I_{g2}
(mA)
300
200
100
0
2
I_a
(A)
1.5
1
0.5
0
$V_{g1}=0$
−5V
−10V
−15V
−20V
−25V
−30V
−35V
$V_{g1}=0$
$V_{g2}=190V$
−5 V
−10V
−15V
−20V
−25V
−30V
−35V
−40V
0
100
200
300
400
500
V_a (V)

PHILIPS

Data handbook

Electronic components and materials

PL519

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